

WHAT IS CLAIMED IS:

1           1.       A method of forming a spin valve sensor, comprising:  
2               forming a ferromagnetic free layer structure that has a magnetic moment;  
3               forming a ferromagnetic pinned layer structure having a magnetic moment;  
4               forming a nonmagnetic conductive spacer layer between the free layer structure and  
5 the pinned layer structure;  
6               forming an anti-ferromagnetic pinning layer coupled to the pinned layer structure for  
7 pinning the magnetic moment of the pinned layer structure;  
8               forming hard magnetic thin films on both sides of at least a portion of the free layer  
9 structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive spacer layer  
10 and the anti-ferromagnetic pinning layer; and  
11              forming a hard bias seedlayer structure adjacent to at least a portion of the free layer  
12 structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive spacer layer  
13 and the anti-ferromagnetic pinning layer, wherein the forming the hard bias seedlayer  
14 structure comprises forming at least a first layer comprising silicon and a second layer  
15 comprising chromium or chromium molybdenum.

1           2.       The method of claim 1, wherein the forming the anti-ferromagnetic pinning  
2 layer further comprising forming a layer of platinum manganese.

1           3.       The method of claim 1, wherein the forming the hard bias seedlayer structure  
2 further comprises forming a layer of tantalum adjacent the silicon layer.

1           4.       The method of claim 3, wherein the forming a layer of tantalum adjacent the  
2 silicon layer further comprises forming the tantalum and silicon layer with equal thickness.

1           5.       The method of claim 3, wherein the forming a layer of tantalum adjacent the  
2 silicon layer further comprises forming the tantalum layer with a thickness half a thickness of  
3 the silicon layer.

1           6.       The method of claim 3, wherein the forming a layer of tantalum further  
2 comprises forming a tantalum-chromium alloy layer.

1           7.       The method of claim 6, wherein the forming the tantalum-chromium alloy  
2 layer further comprises forming the tantalum-chromium alloy layer and the silicon layer with  
3 equal thickness.

1           8.       The method of claim 6, wherein the forming the tantalum-chromium alloy  
2 layer further comprises forming the tantalum-chromium alloy layer with a thickness half a  
3 thickness of the silicon layer.

1           9.       The method of claim 1, wherein the forming the hard bias seedlayer structure  
2 further comprises forming a layer of tantalum, silicon and chromium.

1           10.      The method of claim 1, wherein the forming the hard bias seedlayer structure  
2 further comprises forming a layer of tantalum, silicon and chromium-molybdenum.

1            11.    A method of forming a spin valve sensor, comprising:  
2            forming a spin valve structure including a ferromagnetic free layer, a ferromagnetic  
3            pinned layer and an anti- ferromagnetic pinning layer;  
4            forming hard magnetic thin films adjacent at least a portion of the spin valve structure  
5            on both sides of the spin valve structure; and  
6            forming a hard bias seedlayer structure adjacent at least a portion of the spin valve  
7            structure, wherein the forming the hard bias seedlayer structure comprises forming at least a  
8            first layer comprising silicon and a second layer comprising chromium or chromium  
9            molybdenum.

1            12.    The method of claim 10, wherein the pinning layer comprises platinum  
2            manganese.

1            13.    The method of claim 10, wherein the forming the hard bias seedlayer structure  
2            further comprises forming a layer of tantalum adjacent the silicon layer.

1            14.    The method of claim 13, wherein the forming a layer of tantalum adjacent the  
2            silicon layer further comprises forming the tantalum and silicon layer with equal thickness.

1            15.    The method of claim 13, wherein the forming a layer of tantalum adjacent the  
2            silicon layer further comprises forming the tantalum layer with a thickness half a thickness of  
3            the silicon layer.

1            16.    The method of claim 13, wherein the forming a layer of tantalum further  
2            comprises forming a tantalum-chromium alloy layer.

1           17.     The method of claim 16, wherein the forming the tantalum-chromium alloy  
2     layer further comprises forming the tantalum-chromium alloy layer and the silicon layer with  
3     equal thickness.

1           18.     The method of claim 16, wherein the forming the tantalum-chromium alloy  
2     layer further comprises forming the tantalum-chromium alloy layer with a thickness half a  
3     thickness of the silicon layer.

1           19.     The method of claim 11, wherein the forming the hard bias seedlayer structure  
2     further comprises forming a layer of tantalum, silicon and chromium.

1           20.     The method of claim 11, wherein the forming the hard bias seedlayer structure  
2     further comprises forming a layer of tantalum, silicon and chromium-molybdenum.

1           21.     A method of forming a hard bias seedlayer structure, comprising:  
2             forming a first layer comprising silicon; and  
3             forming a second layer comprising chromium or chromium molybdenum.

1           22.     The method of claim 21 further comprising forming a layer of tantalum  
2     adjacent the silicon layer.